

Japanese Kokai Patent Application No. P2001-186436A

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Job No.: O-02557      Ref.: JP2001-186436/PU030298 JP/RSL(GINA)/ORDER NO. 526  
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(19) JAPANESE PATENT  
OFFICE (JP)(12) KOKAI TOKUHYO PATENT  
JOURNAL (A)(11) KOKAI PATENT APPLICATION  
NO. P2001-186436A

(43) Publication Date: July 6, 2001

(51) Int. Cl. <sup>7</sup> :	Identification Codes:	FI	Theme Codes (Reference)
H 04 N 5/445		H 04 N 5/445	Z 5C025
H 04 H 1/00		H 04 H 1/00	C 5C063
H 04 N 7/025		H 04 N 7/08	A
7/03			
7/035			

Examination Request: Not filed

No. of Claims: 4 (Total of 6 pages; OL)

(21) Filing No.: Hei 11[1999]-371004

(22) Filing Date: December 27, 1999

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1 otherF terms 5C025 BA14 BA25 CA09 CB09 DA01  
(Reference): DA04 DA05

5C063 AA01 AA11 AA20 AB07 EB33

(54) Title ELECTRONIC PROGRAM DISPLAY DEVICE

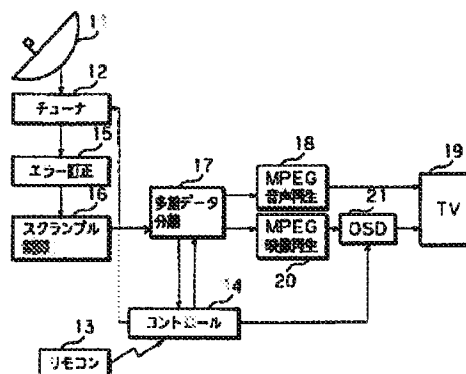
## (57) Abstract

## Problem

When the existing EPG system is used for an EPG display of a BS digital television broadcast, with HDTV, the same program names are displayed for individual channels, and there are problems with visibility and operability, but there is provided an electronic program display device with excellent visibility and operability that improves this.

## Means to solve

When a digital television broadcast is received, in the case of an HDTV broadcast, the individual channels carried in it are consolidated and processed by control circuit (microcomputer) 14, and the individual channels are displayed on the screen of television receiver 19 via OSD circuit 21 in the form of a single channel.



[Figure is translated at the end of document.]

### Claims

1. An electronic program display device characterized in having: a means that receives digital television signals in which high-definition programs and standard programs are mixed within a channel, detects service information from the digital television signals, and displays the electronic program information in a received screen,

a means that consolidates the individual channels corresponding to high-definition programs and displays the programs as single programs when it is determined from the aforementioned received service information that said programs are high-definition programs,

and a means that, when it is determined from the aforementioned received service information that said programs are standard programs, provides program display as programs on the individual channels of the corresponding standard programs.

2. The electronic program display device described in Claim 1, characterized in that the aforementioned means that displays programs as single programs permits cursor selection from any channel if it is within the display area of the single program.

3. The electronic program display device described in Claim 1 or 2, characterized in that the aforementioned means that displays programs as single programs provides a program display for each channel in the following time slot before the end of the high-definition program currently being received.

4. The electronic program display device described in Claim 3, characterized in that the aforementioned means that displays programs as single programs also displays the actual channel selected with the cursor.

### Detailed explanation of the invention

[0001]

Technical field of the invention

The present invention relates to an electronic program display device that provides electronic program display at the receiving side based on the electronic program guide (EPG) transmitted from the broadcast station, and that uses the display to simplify cursor selection, with reception of a satellite digital (BS digital) television broadcast that is scheduled to begin broadcasting in the future, or of a terrestrial digital television broadcast or other digital television broadcast.

[0002]

Prior art

Television broadcasting that is normally being broadcast currently is broadly categorized as terrestrial analog broadcasting and satellite broadcasting, and satellite broadcasting is

additionally categorized as satellite analog television broadcasting (BS broadcasting) and satellite digital television broadcasting (CS broadcasting). Of these, with some terrestrial analog broadcasting channels, in addition to ordinary video and audio television signals, EPG information is also transmitted as data. Methods to demodulate the data at the receiving side and reproduce the EPG screen on the receiver screen have been used.

[0003]

With the EPG system, data are transmitted multiplexed in the form of digital signals in a part of the television broadcast signal vertical blanking interval (VBI), for example, from the 10H to the 13H intervals in odd-numbered fields, or in the 273H to 276H interval in even-number fields. The digital signals are demodulated as video signals with a receiving-side decoder. The demodulated video signals are clamped, and after fluctuation in the DC component is removed, they are digitized by slicing the data information signal portion, digital signals are produced, and program information composed of text or graphics is reproduced.

[0004]

On the other hand, with CS broadcasting, at the transmission side, the names of various types of services and the address, time data, program category, program number, program name and other service identifier (SI) information is transmitted along with the video and audio signals. At the receiving side, first the service ID is designated from the SI signals to select the desired channel. Next, program information is selected based on event IDs that are allocated in units of individual programs within the channels, and it becomes possible for the EPG to be displayed on the receiver screen.

[0005]

With the existing CS broadcast EPG system, an application-free system is used whereby the display content and display screen configuration are preset and transmitted by the broadcast station, and they are reproduced at by the receiver. For display, the receiver screen is divided into 16 parts, and 16 programs in the current broadcast are displayed as a list. Then the content of the pertinent program can be ascertained, or the program can be selected by the viewer at the receiving side selecting by moving a cursor displayed onscreen to the location where an interesting program is displayed with a remote control transmitter (remote control).

[0006]

Although not EPG, as another method of data transmission, a video program system (VPS) has also been put into use whereby the planned broadcast start time for each program is

coded and transmitted by the transmitting side and the desired program on the desired channel can be automatically recorded by the planned start time being preset in a magnetic recording and playback machine (VTR) at the receiving side.

[0007]

With EPG systems, however, in the case of either system, as shown in Figure 5, for example, when the program title, broadcast time, or other program attribute is displayed onscreen, in units of programs for channels 999, 100-102 and 120 from broadcast stations A, B and C, or when a program that is displayed is selected, while it is possible to select the desired program on a channel by operating a cursor that can be moved freely onscreen with a remote control, in each case, display and selection must be in units of programs.

[0008]

Incidentally, in Japan, the start of BS digital television broadcasting is planned for the year 2000, and BS digital television broadcasting will accomplish an increased transmission volume by the use of Trellis 8-phase PSK modulation and broader bandwidth, and it is a flexible, expandable system in which multiple MPEG transport streams (TS) can be transmitted with one BS channel and in which selection of the transmission system is possible according to the service content. It is expected to be the next-generation broadcasting system centered on digital high-definition (HDTV) broadcasting.

[0009]

With broadcasting systems currently being studied, digital signals in which compressed and encoded video, audio and data are continuous are divided into fixed-length blocks. Header information for identifying programs, displaying times, etc., are added and multiplexed into each of the divided blocks, and the specifications are such that multiple programs can be transmitted with one transmission channel.

[0010]

For the multiplexing technology, a system that conforms to the MPEG-2 standard is used. Individual digital signals that are encoded are divided into frame units, for example, header information that represents the display time is added, and packets are constructed by additionally dividing into fixed-length signals. Header information that represents the signal category is also added to the packets. Packets 188 bytes in length to which the header information has been added are called transport stream [packets] (TSP), and when a large number of video, audio, and data TSPs are bundled and made continuous by time division multiplexing, this is called a TS. At

the receiving side, the same data will be reproduced continuously while the data content is identified with the TSP header information.

[0011]

With digital television broadcasting that uses the MPEG-2 multiplexing system, a TS is analogous to a transmission channel, and each program is divided and multiplexed as TSPs, so that by the targeted TSPs being selected at the receiving side, the same program can be selected and reproduced from the header information added to the desired TSP from among multiple programs.

[0012]

One feature of such BS digital television broadcasting is HDTV broadcasting. Use of HDTV requires about 3 times the bandwidth of the bandwidth required for use of standard digital television (SDTV) broadcasting. With a BS digital television broadcasting system, multiple modulation schemes can be selected by the business operator (broadcast station) within a single repeater, and the smallest unit of this is called a slot. When 22 slots are assigned to the business operator, when the business operator utilizes HDTV broadcasting, 20 slots are used, and 2 slots are used for transmission of SI information or other header information. Conversely, when SDTV broadcasting is utilized, 6 slots will be used.

[0013]

Channel assignment to authorized business operators with a BS digital television system is regulated at 1 channel/1 SDTV or 1 channel/1 HDTV. When a business operator assigned 1 channel/1 SDTV utilizes HDTV, bandwidth for 3 channels' worth of SDTV is used for HDTV, so the HDTV channels will be in a form in which 3 SDTV channels are consolidated.

[0014]

For example, assuming that the SDTV channels assigned to business operator B are CH 100, CH 101, and CH 102, rather than a channel specifically for HDTV being assigned anew for HDTV broadcasting, HDTV for the same content will be utilized by still using CH 100, CH 101, and CH 102.

[0015]

Problems to be solved by the invention

With HDTV broadcasting having such BS digital television broadcasting specifications, when the EPG system used for existing analog television or CS digital television is utilized to

display the EPG on the receiver screen, as shown in Figure 6, for example, program information for the individual program units on each channel will be displayed, and selection using cursor movement will also be a selection system for individual program units.

[0016]

For example, as shown in Figure 6, broadcaster B (station B) utilizes channels 100-102 for SDTV, and when HDTV is broadcast for 30 minutes from time "00," program information for the same content will be displayed for each channel 100, 101, and 102 carried in the HDTV broadcast. Additionally, even when the cursor is moved to 100-102 individually on the channel listing, programs with the same content will be repeatedly selected and displayed. Not only does this generate a feeling of annoyance, but the result will be that an unfavorable opinion is given.

[0017]

The present invention was devised to handle such points, and will provide an electronic program display device that will, when an SDTV broadcast is recognized, provide display in program units for each channel and that will, when and HDTV broadcast is recognized, consolidate the channels for SDTV broadcasting carried in the HDTV broadcast into one program and display it, so that HDTV program information for the same content is displayed as one unit, the display is easy to see and easy to understand, and [the viewer] is relieved of a redundant selection operation for the same programs.

[0018]

Means to solve the problems

The present invention is an electronic program display device characterized in having a means that receives digital television signals in which high-definition programs and standard programs are mixed within a channel, detects service information from the digital television signals, and displays the electronic program information in a received screen, a means that consolidates the individual channels corresponding to high-definition programs and displays the programs as single programs when it is determined from the aforementioned received service information that said programs are high-definition programs, and a means that, when it is determined from the aforementioned received service information that said programs are standard programs, provides program display as programs on the individual channels of the corresponding standard programs.

[0019]

The aforementioned means that displays the programs as single programs is also characterized in that cursor selection is possible from any of the channel components if within the area of the single program display.

[0020]

The aforementioned means that displays the programs as single programs is additionally characterized in that a program display for each channel in the following time slot is provided before the end of the HDTV program currently being received.

[0021]

The aforementioned means that displays the programs as single programs is additionally characterized in that the actual channel selected with the cursor is also displayed.

[0022]

#### Embodiment of the invention

An embodiment of the present invention is explained below. Figure 1 is a circuit block diagram that shows an electronic program display device that pertains to the present invention. BS digital broadcast signals received with a parabola antenna 11 are down-converted and supplied to a tuner 12. In the case of a direct tuning operation to select a desired transmission channel from remote control 13 that is operated by the viewer, the channel number of the relevant channel is selected, and the channel data are transmitted to control circuit 14, which has a microcomputer (MC) and a memory, from remote control 13. The channel data received by control circuit 14 are processed by the microcomputer and the data are decoded.

[0023]

As a result, if a channel is tuned, it is supplied to tuner 12, and the desired transmission channel is selected and demodulated by tuner 12. The demodulated digital signal string undergoes error correction with an error correction circuit 15 if there are errors in the signal, and then it is supplied to a scrambling control circuit 16. Signals that have been scrambled, such as with pay broadcasting, are descrambled and restored to the original signal by scrambling control circuit 16, and are supplied to a multiplexed data separating circuit 17.

[0024]

The audio signal, video signal and SI signal are separated by multiplexed data separating circuit 17. The audio signal is supplied to an MPEG audio reproduction circuit 18, it is decoded



to the pre-compression digital signal and is converted to an analog signal if necessary, and is then supplied to a TV receiving device 19 that has a cathode-ray tube, liquid crystal or plasma display, or other display means. The video signal, likewise, is also decoded to a pre-compression digital signal with an MPEG video reproduction circuit 20.

[0025]

An onscreen display (OSD) circuit 21 is connected to the output side of MPEG video reproduction circuit 20, and OSD circuit 21 receives the SI signal from multiplexed data separating circuit 17, and switches between the OSD data signal from control circuit 14 and the signal from video reproduction circuit 20, or superimposes and supplies to TV receiving device 19.

[0026]

Control circuit 14, tunes in a transmission channel from remote control 13 as described above, and, in addition, processes the SI signal from multiplexed data separating circuit 17, supplies OSD data to OSD circuit 21, and also supplies a selection signal that is set/selected by remote control 13 to multiplexed data separating circuit 17. The selection signal is for selecting the desired program from a transmission channel in which many programs are multiplexed and transmitted, and the audio signal and video signal for the desired program are thereby supplied to MPEG audio reproduction circuit 18 and MPEG video reproduction circuit 20.

[0027]

When the EPG is displayed on the screen of TV receiving device 19 with operation of remote control 13 by OSD circuit 21 being activated with OSD data from control circuit 14 and a desired program is selected by operating the up, down, left, and right pointer keys of remote control 13 to move the cursor on the EPG screen, the cursor displayed on-screen is moved, and the desired channel can be selected by indicating the setting at the location of the desired program.

[0028]

The EPG display here is created by the microcomputer software processing by control circuit 14 shown in Figure 2, and the result of the processing will be displayed on-screen. That is, when a key on remote control 13 is operated at step S1, whether there is a request for EPG display is determined at step S2. When the EPG display is specified, advancing to step S3, whether the selected program is HDTV is confirmed with information from the SI signal.

[0029]

When it is determined to be HDTV, processing to consolidate all programs carried with the HDTV is carried out at step S4. Advancing to step S5, an EPG screen as shown in Figure 3 is displayed. When it is determined at step S2 that the EPG display is not selected, [processing] returns to step S1. When it is determined not to be HDTV at step S3, [processing] advances to the EPG display in step S5, and the EPG in SDTV format is displayed.

[0030]

When the up, down, left, or right key of remote control 13 is operated while the EPG screen is displayed and the cursor is moved, the cursor movement is determined at step S6. When the cursor is moved to the next program area, whether the switched program positioned at the cursor is HDTV is determined at step S7, and when it is an HDTV program, HDTV is selected at step S8.

[0031]

When it is determined that the next switched program, set by movement of the cursor at step S7, is not HDTV, SDTV selection for SDTV is carried out at step S8.

[0032]

One example of an EPG screen display that is processed in this way is shown in Figure 3. In this example, a case is illustrated in which the broadcast stations are A, B, and C, and the channels for the three stations are: station A 999, station B 100, 101, and 102, and station C 120. The fact that station B uses the channel numbers from 100 to 102 and provides HDTV broadcasting from time 00:00 to time 00:30 is represented.

[0033]

With the HDTV broadcast, rather than the program content being displayed individually for each channel, that is, for channels 100, 101, and 102, the three channels are consolidated and processed as one channel. Thus, in the HDTV program slot for channels 100-102, a program is displayed as though there were one channel. When the program following time 00:30 is SDTV, the program names for the individual channels are displayed separated in the program slots for channels 100-102.

[0034]

By providing an EPG display in this way, when the viewer wants to watch HDTV from station B, any area of the display location in the HDTV program listing is fine, so that simple,

easy-to-understand setting is possible by aligning the cursor. Furthermore, whether the broadcast is HDTV or SDTV is obvious at a glance just by referring to the EPG screen, and selecting and viewing only HDTV with high picture quality can be selected very conveniently and simply.

[0035]

Even with such a convenient EPG, when HDTV is selected, because three channels have been consolidated and processed, when the HDTV broadcast ends, if the next program is an HDTV broadcast, no problems occur. When the next program is an SDTV broadcast, it is necessary to switch to the individual channel content from the content that was processed by consolidating, and display and cursor processing must be carried out.

[0036]

That is, When HDTV that is been consolidated and displayed as shown in Figure 4 is selected, if the cursor position is within the HDTV program display, HDTV can be selected from anywhere. In actuality, any one of the three channels is selected and processed, so with the example in Figure 4, for example, a case in which the HDTV cursor is selected at the position for channel 101 is shown. It is assumed that after viewing of the HDTV program is completed, switching to another channel on which HDTV is being broadcast cannot be accomplished automatically.

[0037]

To solve this problem, several minutes before the end of the broadcast time for the HDTV currently being viewed, 3 minutes before, for example, an EPG screen as shown in Figure 4 is displayed, and the HDTV program currently being received and the actual HDTV broadcast channel selected, i.e., with this example, the fact that channel 101 was selected, is displayed with a means such as making the area where channel 101 is shown a different color or bold, or filled in, and the SDTV broadcast program in the next time slot is also displayed.

[0038]

Then, this problem can be eliminated by constructing [the device] so that if the program to be viewed next is selected using the cursor during reception of HDTV, it is possible to switch and receive automatically.

[0039]

Concerning the program display for the next time slot, if the receiver is constructed to allow a divided multiple-screen display, the HDTV broadcast can be displayed in a portion of the

screen where there is no reception displayed, or the HDTV may be displayed on a new screen, or it can be displayed with picture-in-picture (PIP) so as to be displayed in a smaller screen on-screen, or with a method such as by superimposing in the lower part of the screen.

[0040]

Various types of applications or modifications of the present invention are also possible in addition to these. For example, digital television broadcasting can also be applied to cable television broadcasting, it can be applied to cases when a compression and transmission system other than MPEG is used for the compression and transmission system, and it is clear that [the invention] is not limited to the application examples.

[0041]

#### Effects of the invention

With the present invention, it is possible to provide an electronic program display device that has ease of viewing and ease of selection and operation, due to the fact that when it is determined by using the SI information that there is an SDTV broadcast, an EPG is displayed in units of programs for each channel, and when it is determined to be HDTV, the SDTV channels providing the HDTV are consolidated and displayed by handling as one program.

[0042]

It is also possible to provide an electronic program display device with excellent handling such that it is possible to move to reception of the next program automatically when the program currently being received ends by selecting with the cursor by displaying the programs in the next time slot before the end of the HDTV broadcast.

#### Brief description of the figures

Figure 1 is a circuit block diagram for explaining an electronic program display device that pertains to the present invention.

Figure 2 is a flow chart for explaining the operation of an electronic program display device that pertains to the present invention.

Figure 3 is an explanatory diagram that shows an example of an EPG screen display by an electronic program display device that pertains to the present invention.

Figure 4 is an explanatory diagram that shows another display example for an EPG screen by an electronic program display device that pertains to the present invention.

Figure 5 is an explanatory diagram that shows a display example of an existing EPG screen.

Figure 6 is an explanatory diagram that shows an example of an EPG screen display for BS digital television broadcasting using an existing EPG display technique.

#### Explanation of symbols

- 13 Remote control
- 14 Control circuit
- 17 Multiplexed data separating circuit
- 19 Television receiving device
- 20 MPEG video reproduction circuit
- 21 OSD circuit

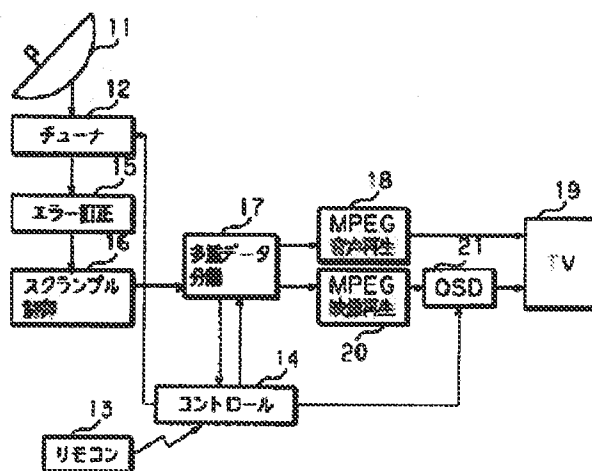


Figure 1

- Key:
- 12 Tuner
  - 13 Remote control
  - 14 Control
  - 15 Error correction
  - 16 Scrambling control
  - 17 Multiplexed data separation
  - 18 MPEG audio reproduction
  - 20 MPEG video reproduction

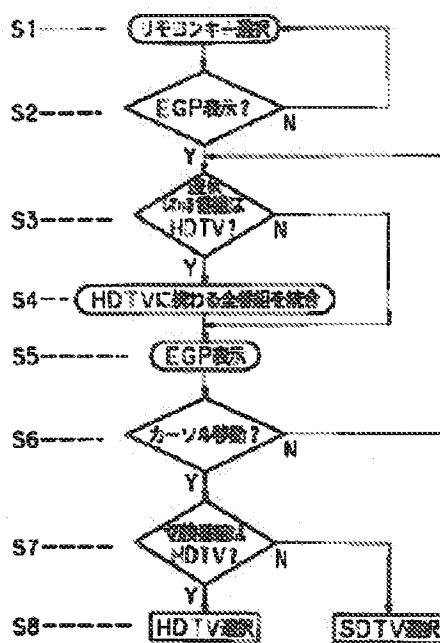


Figure 2

- Key:
- S1 Remote control key selection
  - S2 EGP [sic; EPG] display?
  - S3 Is selected program HDTV?
  - S4 All programs carried on HDTV are consolidated
  - S5 EGP display
  - S6 Cursor moved?
  - S7 Is switched program HDTV?
  - S8 HDTV selected
  - SDTV selected

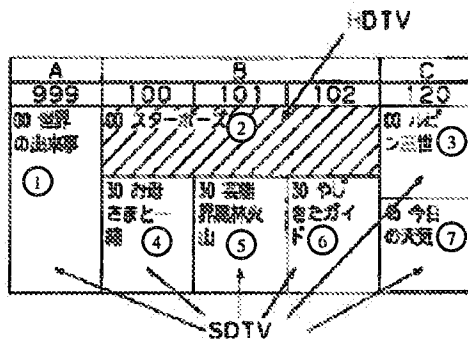


Figure 3

- Key:
- 1 World Affairs
  - 2 Star Pose

- 3 Lupin the Third
- 4 Mother and I
- 5 Entertainment: Furin Kazan [military drama]
- 6 Yajikita [a movie] Guide
- 7 Today's Weather

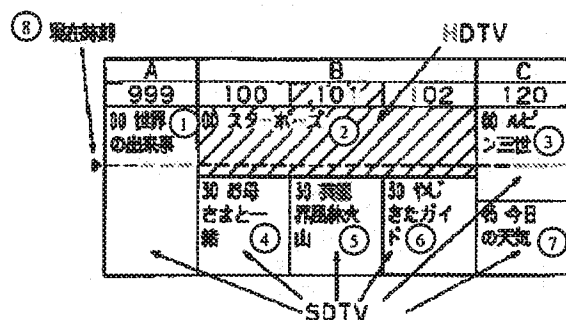


Figure 4

- Key:
- 1 World Affairs
  - 2 Star Pose
  - 3 Lupin the Third
  - 4 Mother and I
  - 5 Entertainment: Furin Kazan
  - 6 Yajikita Guide
  - 7 Today's Weather
  - 8 Current time

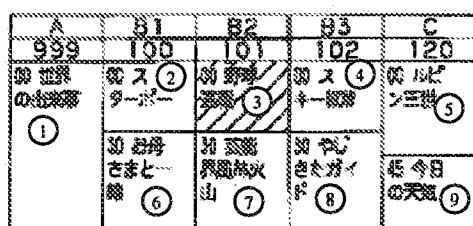


Figure 5

- Key:
- 1 World Affairs
  - 2 Star Pose
  - 3 Baseball Bulletin
  - 4 Skiing Now
  - 5 Lupin the Third
  - 6 Mother and I
  - 7 Entertainment: Furin Kazan
  - 8 Yajikita Guide
  - 9 Today's Weather

